

1. JP,2000-505958,A

Two-dimensionally balanced positioning device with two object holders, and lithographic device provided with such a positioning device

Patent number: JP2000505958T

Publication date: 2000-05-16

Inventor:

Applicant:

Classification:

- **international:** B23Q1/62; B23Q11/00; G03F7/20; H01L21/68;
B23Q1/25; B23Q11/00; G03F7/20; H01L21/67; (IPC1-
7); H01L21/027; G03F7/20; H01L21/68

- **european:** B23Q1/62A; B23Q1/62A1; B23Q11/00D; G03F7/20T24;
G03F7/20T26; H01L21/68M

Application number: JP19980528568T 19971003

Priority number(s): EP19960203709 19961224; EP19970200706 19970310;
WO1997IB01209 19971003

Also published as:

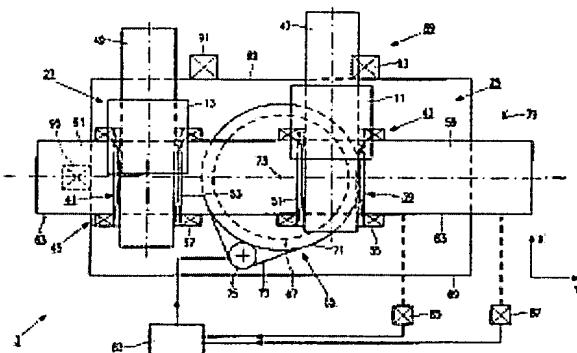
WO9828665 (A1)
WO9828665 (A1)
US5969441 (A1)
JP2004363619 (A)

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Abstract not available for JP2000505958T

Abstract of corresponding document: **US5969441**

Two-dimensionally balanced positioning device with two object holders, and lithographic device provided with such a positioning device. A positioning device (3, 97, 179) with a first displacement unit (25, 189) for displacing a first object holder (11, 181) and a second displacement unit (27, 191) for displacing a second object holder (13, 183). The object holders can be displaced by the positioning device alternately from a measuring position into an operational position and can be displaced by the respective displacement units independently of one another in the measuring position and in the operational position. The displacement units are provided with force actuators which each have a first part (47, 49; 117, 119; 215, 217) which is coupled to the relevant object holder and which is displaceable under the influence of a driving force relative to a second part (59, 61; 133, 135, 137, 139; 219, 221) which is fastened to a balancing unit (69, 149, 205) which is common to the two displacement units. The balancing unit is displaceably guided relative to a base (81, 209), so that reaction forces of the displacement units are converted into displacements of the balancing unit relative to the base, and mechanical vibrations in the balancing unit and the base are prevented. The use of the force actuators prevents the displacements of the balancing unit from disturbing the positions of the object holders relative to the base. The positioning device is further provided with a control unit (83, 169, 237) by means of which at least the parts (47, 49; 121, 123; 219, 221) directed parallel to an X-direction of the X-actuators (39, 41; 105, 107; 211, 213) coupled to the object holders are held in positions parallel to the X-direction. It is also prevented in this manner that positions of the object holders relative to the



base are interfered with by rotations of the balancing unit caused by the reaction forces of the displacement units. The positioning device can be used in a lithographic device for the displacement of a semiconductor substrate relative to an exposure system of the lithographic device and for the displacement of a mask relative to the exposure system.

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CLAIMS

[Claim(s)]

1. It Has Base, 1st Mobile Unit, and 2nd Mobile Unit, and is Said 1st Migration. Unit in Parallel with the Direction of X It is at said base in parallel with the direction perpendicular to this direction of X of Y. Receive and it has the 1st goods holder which can move. Said 2nd mobile unit is parallel to the direction of X. It has the 2nd goods holder which can move to said base in parallel with the direction of Y. Above The 1st goods holder and the 2nd goods holder are a pair to said base in the actuated position from a measuring point. It carries out, and is continuously movable and they are said 1st mobile unit and the 2nd mobile unit. Are movable to mutual during actuation respectively. A part for part I which makes driving force act mutually, ** It has a part for ****2**. Said 1st mobile unit, And said 1st [the] of the 2nd mobile unit In the pointing device with which the part is connected with said 1st goods holder and the 2nd goods holder in parallel with the direction of Y in parallel in the direction of X, respectively the direction of X -- parallel -- the direction of Y it was alike in parallel and prepared -- said -- the 1st mobile unit And said part II of the 2nd mobile unit A part Said 1st mobile unit, And balance unit common to the 2nd mobile unit It connects and is said BE in parallel with the direction of Y in parallel to the direction of X about said balance unit. While showing around movable to SU Said 1st mobile unit and 2nd migration YU It is ** as the description about having formed the force actuator which generates driving force to knitting, respectively.

2. The force actuator of said 1st mobile unit and the 2nd mobile unit is RO chiefly. It indicates to claim 1 characterized by being constituted so that - RENTSU force may be generated. Pointing device.
3. It is static pneumatic bearing about the slideway top of the base which extends in parallel with the direction of Y in parallel in the direction of X. It is ** about having constituted so that said balance unit might be guided movable. Claim 1 considered as the mark, or pointing device given in 2. They are X actuator and Y actuator to said 4.2 mobile units, respectively. It prepares. In said X actuator, it is each in parallel with the direction of Y in parallel to the direction of X. A part for part I is prepared. Said goods holder of said mobile unit related in a part for this part I It connects. ** of said X actuator related in a part for said part I parallel to the direction of X It is supposed to two parts that it is movable. A part for part I is prepared in said Y actuator, respectively. To a part for said part II of X actuator of the mobile unit related in a part for this part I It fixes. ***** fixed to said balance unit in a part for part I parallel to the direction of Y ** characterized by making it movable to a part for part II of a ***** Y actuator Pointing device given in any 1 term of *** 1-3.
5. the control unit which controls at least one actuator -- said ***** ** -- preparing -- this control unit -- said X AKUCHI of said two mobile units YUETA -- a part for said part II can be held in a location parallel to the direction of X at least -- as -- Pointing device according to claim 4 characterized by carrying out.
6. Common Straight Line Which Said Part I of Said Y Actuator is Made to Meet, and it Shows to it Movable Interior of Proposal is Established in Said Y Actuator of Said Mobile Unit. Said positioning device A part for part I which prepared the pivotable unit and was fixed to said balance unit, It is a pair to a part for said part I in the surroundings of axis of rotation which extends at right angles to the direction of Y perpendicularly in the direction of X. It is said pivotable YU about a part for part II pivotable and fixed [carried out, and] to said common straight-line guidance. Pointing device according to claim 4 characterized by preparing in knitting.
7. It is ** about having constituted so that said control unit might control said pivotable unit. Claim 5 considered as the mark, or pointing device given in 6.
8. Said Balance Unit is Slideway Which Extends in Parallel with the Direction of Y in Parallel in the

Direction of X. It Has Formed Base Material. This slideway is common to said two goods holders. This slideway is met. Said two goods holders in parallel with the direction of X Parallel to the direction of Y Suppose that it is movable and a joint member is prepared in said both goods holders. To this joint member It is said X actuator of said 1st mobile unit about said goods holder which carries out *****. To a part for said part I And said ** of said X actuator of said 2nd mobile unit Positioning according to claim 4 characterized by constituting so that it can connect with one part Equipment.

9. Joint Member of Said Goods Holder is Ingredient about XY Lorentz-Force Actuator, Respectively. A Part for Part I Which Obtained and was Fixed to Related Goods Holder, Before a related mobile unit He is said XY Lorre about a part for part II fixed to a part for said part I of an account X actuator. It prepares in a NTSU force actuator. Said ** of said XY Lorentz-force actuator One part is a part for said part II of said two XY Lorentz-force actuators, respectively. Pointing device according to claim 8 characterized by constituting so that it can collaborate.

It is **, respectively about a part for part II which extends in parallel with the direction of Y in said 10.2 mobile units. Y actuator of two beams is formed, respectively. perpendicular to the direction of Y at right angles to the direction of X the surroundings of the prolonged rotation shaft -- said X actuator of said two mobile units said two part I of said Y actuator related in a part for said part II -- opposite Perilla frutescens (L.) Britton var. crispa (Thunb.) Decne. It constitutes rotatable. ***** -- They are said both mobile units by said control unit. Claim 5 characterized by controlling said Y actuator Or pointing device given in 8.

11. FU Which Fixes Radiation Source, Mask Holder, Focusing Unit, and Pointing Device It Has REMU. Said focusing unit has a principal axis and said pointing device is this Lord. In parallel with the direction of X perpendicular to an axis And it is perpendicular to the direction of X, and is a method perpendicular also to said principal axis of Y. RISOGURA equipped with a movable base material holder to said focusing unit in parallel with ** In FU equipment Each of said two goods holders of said pointing device describes above. It is the base material holder of RISOGURAFU equipment. Said base of said positioning device is said FU. While being fixed to REMU, said focusing unit -- minding -- said radiation source -- base material the location which may irradiate the base material which can be installed on a holder -- said actuated position of said base material holder it is -- A pointing device given in any 1 term of claims 1-10 is ***** here. RISOGURAFU equipment characterized by being a ***** pointing device.

12. Said RISOGURAFU equipment is equipped with a separate pointing device, and it is this separate pointing device. Said focusing unit is received in parallel with the direction of X at least in said mask holder. RISOGURAFU equipment according to claim 11 characterized by constituting movable.

13. Said Two Goods Holders of Said Separate Pointing Device -- Respectively Parallel to the Direction of X Said Li Who May be Positioned by Said Separate Pointing Device in Parallel Also with the Direction of Y It is Mask Holder of SOGURAFU Equipment. Said base of said separate positioning device While being fixed to said frame, The mask which can be installed on a mask holder is described above. The location which may be irradiated according to the radiation source is an actuated position of said mask holder. Claim A pointing device given in any 1 term of 1-10 is ** with said separate pointing device. RISOGURAFU equipment according to claim 12 characterized by *****.

14. A pointing device separate from a pointing device and a focusing unit and the radiation source are fixed. It has the frame to carry out. Said focusing unit has a principal axis and is said pointing device. In parallel with the direction of X perpendicular to this principal axis And it is perpendicular to the direction of X, and perpendicular also to said principal axis are . It has a movable base material holder to said focusing unit in parallel with the direction of Y. Before The pointing device of the individual according to account is [as opposed to / in parallel with the direction of X / said focusing unit] ** at least. In RISOGURAFU equipment equipped with the mask holder in which ** is possible Said separate location Said two goods holders of arrangement equipment in parallel with the direction of X, respectively It is Taira also to the direction of Y. Said RISOGURAFU equipment which may be positioned by the line with said separate pointing device It is a mask holder. Said base of said separate positioning device is on said frame. While being fixed, It is said radiation source about the mask which can be installed on a mask holder. The location which may irradiate is an actuated position of said mask holder, and claims 1-10 are not. It is the description about a pointing device given in ** or the 1st term being said separate pointing device. RISOGURAFU equipment to carry out.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

RISOGURAFU equipment which has the 2-dimensional balance positioning device which has two goods holders, and this positioning device This invention Base, It has the 1st mobile unit and the 2nd mobile unit. The 1st mobile unit in parallel with the direction of X It has the 1st goods holder which can move to the base in parallel with the direction perpendicular to this direction of X of Y. The 2nd mobile unit has the 2nd goods holder which can move in the direction of X to the base in parallel in parallel with the direction of Y. The 1st goods holder and the 2nd goods holder are continuously movable from a measuring point to the base to an actuated position, and the 1st mobile unit and the 2nd mobile unit are movable to mutual during actuation respectively. It has a part for a part for part I which makes driving force act mutually, and part II, and is related with the pointing device connected with the 1st goods holder and the 2nd goods holder in parallel with the direction of Y in parallel in the direction of X, respectively by the amount of [of the 1st mobile unit and the 2nd mobile unit] part I.

Moreover, this invention is equipped with the frame which fixes the radiation source, a mask holder, a focusing unit, and a pointing device, and it has a principal axis, and the focusing unit of a pointing device is perpendicular to the direction of X in parallel with the direction of X perpendicular to this principal axis, and is related with the RISOGURAFU equipment equipped with a movable base material holder to a focusing unit in parallel with the direction perpendicular also to a principal axis of Y.

Furthermore, a pointing device with this invention separate from a pointing device and a focusing unit, Have the frame which fixes the radiation source and a focusing unit has a principal axis. A pointing device is perpendicular to the direction of X in parallel with the direction of X perpendicular to this principal axis. In parallel with the direction perpendicular also to a principal axis of Y It has a movable base material holder to a focusing unit, and a separate pointing device is related with the RISOGURAFU equipment equipped with the movable mask holder to the focusing unit in parallel with the direction of X at least.

The pointing device of the class stated to the first paragraph is known from the European Patent public presentation No. 525872. this known pointing device -- optical RISOGURAFU -- in order to manufacture an integrated semiconductor circuit, it is used for optical RISOGURAFU equipment by law. According to the light source and a lens system, RISOGURAFU equipment is the dimension to which the detailed pattern of such a semiconductor circuit on a mask was reduced, and carries out image formation on a semi-conductor base material. Since such a semiconductor circuit has complicated structure, it needs to expose a semi-conductor base material many times, and needs to use a different mask which has a detailed pattern which is different in whenever [the]. One by one, a mask is picked out from a magazine and installed in the actuated position in RISOGURAFU equipment by the known pointing device. While moving the mask picked out from the magazine to the actuated position, a mask passes a measuring point and the location which a mask occupies to the criteria location of RISOGURAFU equipment in this measuring point is measured. During the migration of a mask to an actuated position from a measuring point, since the location of a goods holder to which a mask is moved is measured to the above-mentioned criteria location, a mask can be installed in the actuated position which he wishes to a criteria location through suitable migration of a goods holder. A related goods holder maintains a mask during exposure of a semi-conductor base material to the actuated position to wish. Then, other goods holders pick out the following mask from a magazine, and move this mask to a measuring point. Thus, while a front mask is in an actuated position and is exposing a semi-conductor base material through the last mask by using two mobile units with two goods holders, the location of the following mask can be measured to a criteria location. Thus, the volume of RISOGURAFU equipment can be increased remarkably.

Furthermore, generally use of the pointing device of the class stated to the first paragraph is known in a

machine tool and a machining facility. In this case, the work supported by one piece or two goods holders measures the location occupied to this goods holder in a measuring point. Next, a related goods holder is moved to the actuated position which should process work with work. The actuated position which a related goods holder measures the location occupied to the criteria location of a machine tool in an actuated position, consequently wishes to have work to a criteria location can be brought. The volume of a machine tool, i.e., a machining facility, can be remarkably increased by using two mobile units with two goods tables also in this case. While this is processing front work, it is because the following work is already moved to the measuring point.

The 1st mobile unit of a known pointing device and the 2nd mobile unit are equipped with a part for a part for part I fixed to the related goods holder, and part II fixed to the base, respectively, and a part for a part for above-mentioned part I of each mobile unit and part II is relatively [mutual] movable, making driving force act mutually. The fault of this known positioning device is two parts of a mobile unit being fixed to the base, respectively, therefore forming the common base for the 1st mobile unit and the 2nd mobile unit. Reaction force acts on a part for part II during migration of a goods holder, and this force is transmitted to the base. The above-mentioned reaction force causes the mechanical oscillation of the base, and the vibration is transmitted to a part for part II, and a goods holder. If the 1st goods holder is in an actuated position, while the following mask moves to a measuring point from a magazine, mechanical oscillation will arise in the 1st goods holder as a result of the reaction force which acts on the base with the 2nd mobile unit. Such a mutual interference between two mobile units will make positioning of a mobile unit inaccurate. Usually, this is not desirable. Furthermore, the mechanical oscillation generated at the base is also transmitted to other parts of the equipment which uses a known pointing device. Usually, this is not desirable, either.

The purpose of this invention makes the base common to two mobile units, and is to obtain the pointing device of the class indicated by the first paragraph which prevented the above mutual interference of two mobile units which is not desirable as much as possible.

The 1st mobile unit which prepared this invention in the direction of X in parallel with the direction of Y in parallel for this purpose, And while connecting a part for part II of the 2nd mobile unit with a balance unit common to the 1st mobile unit and the 2nd mobile unit and guiding a balance unit in the direction of X movable to the base in parallel in parallel with the direction of Y It is characterized by forming the force actuator which generates driving force in the 1st mobile unit and the 2nd mobile unit, respectively. It is understood as the word of a "force actuator" meaning the actuator which generates the driving force of a predetermined value. Furthermore, such a force actuator and the so-called location actuator are known for generating the migration which has a predetermined value.

Since a balance unit is used, the reaction force which acts on a part for part II by part for part I of the mobile unit of a positioning device is not transmitted to the base, but it acts on the balance unit which can move to the base, and this reaction force is changed into migration of the balance unit to the base. Thereby, it can prevent that the mechanical oscillation of the base and a balance unit is prevented as much as possible, and this vibration conducts to a goods holder as much as possible. The location of the goods holder to the base is determined by the value of the driving force of the mobile unit of a pointing device, and the value of the above-mentioned driving force is controlled by the control unit. Since driving force is generated by the force actuator, driving force, such as this, has been independent substantially [the location for part I of the mobile unit to a part for part II], therefore the location of the goods holder to the base has been independent of the location of the balance unit to a goods holder substantially. Thereby, according to the reaction force of one mobile unit of two mobile units, migration of the balance unit to the base parallel to the direction parallel to the direction of X of Y does not have effect substantially in the location of the goods holder of the mobile unit of another side to the base, therefore can prevent the mutual active jamming between the positioning accuracy of a mobile unit of two pieces as much as possible. Furthermore, when a balance unit is a common balance unit for two mobile units, the simple structure of a pointing device is attained.

A photo-copying machine is known from U.S. Pat. No. 5208497, and this known copying machine has a single mobile unit, and makes the optical unit movable in parallel with this mobile unit in the single scanning direction. This mobile unit also has a balance unit, this balance unit is connected with an optical unit, and this balance unit also makes it movable in parallel in the scanning direction. However, U.S. Pat. No. 5208497 does not show use of two mobile units which have a goods holder movable in parallel in the direction perpendicular to the direction of X of Y in parallel with the direction of X, respectively, and also making mobile units, such as this, collaborate in the direction of Y in parallel with the direction of X at a common balance unit movable in parallel is not shown.

The special example of this invention positioning device is characterized by constituting the force actuator

of the 1st mobile unit and the 2nd mobile unit so that the Lorentz force may be generated chiefly. By use of the force actuator which generates a Lorentz force chiefly, driving force of a mobile unit can be made into what became independent of the relative position for a part for part I of a mobile unit, and part II mostly, and the practical and easy structure of a force actuator can be acquired especially.

It is characterized by other examples of this invention positioning device constituting the slideway top of the base which extends in parallel with the direction of Y in parallel in the direction of X so that a balance unit may be guided movable by static pneumatic bearing. By using a static gas bearing, guidance without almost friction of the balance unit to the base is obtained, and migration of the balance unit which receives an operation of the reaction force of a mobile unit is not influenced according to the frictional force generated between a balance unit and the slideway of the base. When it has such influence on migration of a balance unit, a balance unit and the base are made to produce the residual mechanical vibration which is not desirable.

The example of further others of this invention positioning device forms X actuator and Y actuator in two mobile units, respectively. A part for part I is prepared in the direction of X in parallel with the direction of Y in parallel at X actuator, respectively. Connect a part for this part I with the goods holder of a related mobile unit, and a part for this part I parallel to the direction of X is made movable to a part for part II of related X actuator. A part for part I is prepared in Y actuator, respectively, a part for this part I is fixed to a part for part II of X actuator of a related mobile unit, and it is characterized by making movable a part for part I parallel to the direction of Y to a part for part II of related Y actuator fixed to the balance unit. It is movable in the direction of Y with X actuator of the mobile unit to which a goods holder relates with the suitable driving force of Y actuator of a related mobile unit in this example while a goods holder becomes movable in the direction of X with the suitable driving force of X actuator of a related mobile unit parallel, respectively. While the reaction force of X actuator of two mobile units is transmitted to a balance unit through Y actuator through a part for part II of X actuator, the reaction force of Y actuator of two mobile units is directly transmitted to a balance unit through a part for part II of Y actuator.

The special example of this invention positioning device prepares the control unit which controls at least one actuator in a positioning device, and is characterized by the thing of X actuator of two mobile units for which it enabled it to hold a part for part II in a location parallel to the direction of X at least with this control unit. As stated above, migration of a balance unit parallel to the direction of X over the base produced according to the reaction force of two mobile units and migration of a balance unit parallel to the direction of Y over the base do not have effect mostly in the value of the driving force of two mobile units, and the location of two goods holders to the base is not mostly blocked by such migration of a balance unit. The same thing is materialized also about the migration of a balance unit carried out with a component parallel to the both directions of the direction of X, and the direction of Y. However, the reaction force of a mobile unit makes the surrounding mechanical torque of the axis which extends at right angles also to the direction of Y perpendicularly in the direction of X act on a balance unit. Furthermore, if a means is not provided, the above-mentioned mechanical torque makes rotation of a balance unit and the mobile unit connected at it produce around the axis of rotation to which it points at right angles to the direction of Y at right angles to the direction of X. If driving force of a mobile unit is not fitted further, such rotation makes a goods holder moved to the base in parallel with the direction of X in parallel with the direction of Y, therefore the location of the goods holder to the base is influenced by the above-mentioned rotation of a balance unit. By using the above-mentioned control unit for controlling the above-mentioned actuator, even if there are few X actuators of a mobile unit, a part for part II is held in a location parallel to the direction of X. It is parallel to the direction of X, and since a goods holder is connected with a part for part I of X actuator parallel to the direction of Y, by using the above-mentioned control unit, rotation of surrounding X actuator of the axis of rotation to which it points at right angles also to the direction of Y perpendicularly in the direction of X, and the goods holder connected with this is prevented, and migration of the goods holder to the base produced from such rotation is prevented. Therefore, the reaction force and the reaction force torque which goes together and joins a balance unit of a mobile unit do not have effect mostly in the location of the goods holder to the base.

Other examples of this invention positioning device establish the interior of a common straight-line proposal which part I of Y actuator is made to meet and it shows to it movable in Y actuator of a mobile unit. A part for part I which prepared the pivotable unit in the positioning device and was fixed to the balance unit, It is characterized by preparing a part for part II which is pivotable and was fixed to the surroundings of axis of rotation which extends at right angles to the direction of Y perpendicularly in the direction of X by common straight-line guidance to a part for part I in a pivotable unit. In this example, while making movable

mutually a part for part I of Y actuator separately along the interior of a common straight-line proposal, the goods holder connected with a part for part I and it of X actuator is mutually made movable separately to a part for part II of X actuator fixed to a part for part I of Y actuator. While the reaction force of X actuator is transmitted to a balance unit through related Y actuator, the interior of a common straight-line proposal, and a pivotable unit, the reaction force of Y actuator is transmitted to a balance unit through the interior of a common straight-line proposal, and a pivotable unit. During actuation, the 1st goods holder in an actuated position and the 2nd goods holder in a measuring point become independent mutually, and are movable to the base. In order to move the 2nd goods holder from a measuring point to an actuated position, by the pivotable unit, covering the include angle of 180 degrees, common straight-line guidance is rotated and the 1st goods holder is moved from an actuated position to the surroundings of the above-mentioned axis of rotation at a measuring point at coincidence. The measuring point from an actuated position can be made to move the 1st goods holder and the 2nd goods holder to an actuated position from a measuring point by attaining the simple structure of a pointing device and making the interior of a common straight-line proposal only rotate by use of the interior of a common straight-line proposal, and a pivotable unit. In the example of further others of this invention pointing device, it is characterized by controlling a pivotable unit with a control unit. In this example, a pivotable unit has two functions, especially, it is easy and the pointing device of practical structure is obtained. That is, a pivotable unit is used for two purposes for holding the interior of a common straight-line proposal in a location parallel to the direction of Y, therefore holding a part for part II of X actuator in a location parallel to the direction of X through suitable control of the pivotable unit by the control unit, in rotation of common straight-line guidance, in order to make the measuring point from an actuated position move a goods holder to an actuated position from a measuring point.

The special example of this invention positioning device a balance unit in parallel with the direction of X Have the base material which prepared the slideway which extends in parallel with the direction of Y, and this slideway is common to two goods holders. Along with this slideway, two goods holders are made movable in parallel in the direction of Y in parallel in the direction of X. A joint member is prepared in both goods holders, and it is characterized by constituting so that the goods holder related by this joint member can be connected with a part for a part for part I of X actuator of the 1st mobile unit, and part I of X actuator of the 2nd mobile unit. The goods holder of this example is guided by the static gas bearing movable in the common slideway top belonging to a balance unit. This base material is for example, granite slab, and is with the function to support and guide two functions, i.e., two goods holders, and the function which forms the balance unit for two mobile units. While moving the 1st goods holder to an actuated position from a measuring point and moving the 2nd goods holder to a measuring point from an actuated position, goods holders, such as this, need to pass through a common slideway top mutually. In order to attain this, while moving the 1st goods holder to the 1st mid-position between a measuring point and an actuated position from a measuring point with the 1st mobile unit, the 2nd goods holder is moved to the 2nd mid-position of the next door of the 1st mid-position between a measuring point and an actuated position from an actuated position with the 2nd mobile unit. In the mid-position, such as this, the 1st goods holder is removed from the 1st mobile unit, it connects with the 2nd mobile unit, on the other hand, the 2nd goods holder is removed from the 2nd mobile unit, and it connects with the 1st mobile unit. Next, while moving the 1st goods holder from the 1st mid-position to an actuated position with the 2nd mobile unit, the 2nd goods holder is moved from the 2nd mid-position to a measuring point with the 1st mobile unit. Since the above-mentioned joint member is prepared in goods holders, such as this, the distance which the amount of [of a mobile unit] part I must move to a part for part II to which a mobile unit relates, and which collaborates can decrease, and can decrease the required dimension of a mobile unit. Furthermore, if it must be made for the migration part of the 1st mobile unit and the migration part of the 2nd mobile unit to pass mutually, a mobile unit will serve as comparatively complicated structure, but it has prevented becoming complicated so that mutual passage may not be performed.

It is characterized by other examples of this invention positioning device constituting the joint member of a goods holder, respectively so that a part for part II fixed to a part for part I of X actuator of the mobile unit relevant to a part for part I which was equipped with XY Lorentz-force actuator and fixed to the related goods holder may be prepared in XY Lorentz-force actuator and the amount of [of XY Lorentz-force actuator] part I can collaborate in a part for part II of two XY Lorentz-force actuators, respectively. The above-mentioned XY Lorentz-force actuator has two functions, respectively, is simple and can make a pointing device practical structure. With the above-mentioned XY Lorentz-force actuator, a goods holder can be moved in a comparatively high precision to a part for part I of X actuator of a related mobile unit

covering a comparatively slight distance. Since a part for a part for part I of such a Lorentz-force actuator and part II is chiefly connected according to a Lorentz force, parts, such as this, can be easily separated and connected mutually by ****(ing) a Lorentz force, respectively and energizing it. The structure for part I, such as this with which it was made for the amount of [of XY Lorentz-force actuator] part I to collaborate in a part for part II of both XY Lorentz-force actuators, respectively, can take over a part for each part I of two XY Lorentz-force actuators to a part for part II of other XY Lorentz-force actuators in the above-mentioned mid-position of a goods holder.

The example of further others of this invention pointing device forms two Y actuators which prepared a part for part II which extends in parallel, respectively in the direction of Y at two mobile units, respectively. A part for part II of X actuator of two mobile units is constituted rotatable to two part I of related Y actuator, respectively around the rotation shaft perpendicularly prolonged at right angles to the direction of Y in the direction of X. It is characterized by controlling Y actuator of both mobile units by the control unit. In this example, in response to an operation of the reaction force of a mobile unit, rotation of the balance unit to the base occurs around the axis of rotation to which it points at right angles also to the direction of Y perpendicularly in the direction of X, and the amount of [of Y actuator of two mobile units fixed by the balance unit] part II also rotates to the base. Since a part for part II of X actuator is connected with a part for part I of both Y actuators of a related mobile unit rotatable, a part for part II of X actuator of both mobile units can be held in a location parallel to the direction of X, and two Y actuators of a related mobile unit can be moved covering distance which is mutually different to a balance unit. Thus, since rotation of a balance unit and a mobile unit is prevented, use of a separate actuator can be avoided and the comparatively easy structure of a pointing device can be acquired.

The RISOGURAFU equipment which has the movable base material holder of the class indicated to the first paragraph is known from the European Patent public presentation No. 498496. This known RISOGURAFU equipment is used for manufacture of the integrated semiconductor circuit by the optical RISOGU rough process. The radiation source of this known RISOGURAFU equipment is the light source, and a focusing unit carries out image formation of the detailed pattern of an integrated semiconductor circuit with the scale reduced according to this lens system on the semi-conductor base material which is an optical lens system and can be installed on the base material holder of a pointing device. This detailed pattern is on a mask and can install this mask on the mask holder of RISOGURAFU equipment. Such a semi-conductor base material has very many fields in which the same semiconductor circuit should be prepared. Each field of a semi-conductor base material is continuously exposed for this purpose. During exposure of each field of this, a semi-conductor base material is in a fixed location to a mask and a focusing unit, and the next field of a semi-conductor base material is brought to the location to a focusing unit with a pointing device between two continuous exposure processes. A repeat and the integrated semiconductor circuit of comparatively complicated structure can be manufactured many times using a different mask showing a detailed pattern which is different for whenever [that / every] in this process. The structure of such an integrated semiconductor circuit has a detail dimension in the range below a micron. Therefore, it is necessary to carry out image formation of the detailed pattern which exists on a sequential mask on the above-mentioned field of a semi-conductor base material in a mutual precision in the range below a micron. Therefore, the semi-conductor base material should be positioned in a certain precision to the mask and the focusing unit with the pointing device with the precision below a micron. Furthermore, in order to restrict time amount required for manufacture of a semiconductor circuit, a semi-conductor base material should be comparatively moved between two sequential exposure processes at high speed.

this invention RISOGURAFU equipment which has a movable base material holder The radiation source and a mask holder, Have the frame which fixes a focusing unit and a pointing device, and a focusing unit has a principal axis. In the RISOGURAFU equipment which is perpendicular to the direction of X in parallel with the direction of X perpendicular to this principal axis as for a pointing device, and is equipped with a movable base material holder in the direction perpendicular also to a principal axis of Y to a focusing unit in parallel Each of two goods holders of a pointing device is the base material holder of RISOGURAFU equipment. While the base of a positioning device is being fixed to the frame, the location which may irradiate the base material which can be installed on a base material holder according to the radiation source through a focusing unit is an actuated position of a base material holder, and it is characterized by being the above-mentioned positioning device which the positioning device of this invention uses here. In order that the 1st semi-conductor base material which exists during actuation (for example, the 1st base material holder top) by using this invention pointing device may measure correctly the location occupied to the 1st base material holder, it makes it possible to use the measuring point of a pointing device. In the meantime, the

2nd semi-conductor base material which exists on the 2nd base material holder may be irradiated. As mentioned above, the location of the 11th base material holder to the base is not substantially influenced during migration of the 2nd base material holder required during exposure according to the reaction force which acts on the balance unit of a positioning device with the mobile unit of the 2nd base material holder. Consequently, measurement of the location of the 1st semi-conductor base material to the 1st base material holder does not receive an operation mostly according to the above-mentioned reaction force. Moreover, the frame of RISOGURAFU equipment does not generate vibration which is not desirable, and this is because migration of a base material holder does not make the base of a positioning device generate mechanical oscillation substantially. Before moving the 1st semi-conductor base material to an actuated position, since the above-mentioned location of the 1st semi-conductor base material is already measured correctly, it does not need to arrange the 1st semi-conductor base material to a focusing unit in an actuated position, and comparatively easy measurement of the location of the 1st base material holder to a focusing unit is enough as it is in an actuated position. By using this invention pointing device, the output of RISOGURAFU equipment can be increased remarkably and the array of a semi-conductor base material [as opposed to a focusing unit in this] is usually because it is the activity which takes time amount.

It is characterized by having equipped RISOGURAFU equipment with the separate pointing device, and the special example of this invention RISOGURAFU equipment which has a movable base material holder constituting [with this separate pointing device] a mask holder movable to a focusing unit in parallel with the direction of X at least. During exposure of each field of a semi-conductor base material, in parallel with the direction of X, to a focusing unit, the semi-conductor base material which should be manufactured synchronizes and moves [not the fixed location to a mask and a focusing unit but during exposure] a semi-conductor base material and a mask in this special example of this invention RISOGURAFU equipment, respectively with the mobile unit of a related base material holder, and a pointing device with a separate mask holder. Therefore, the pattern on a mask is scanned in parallel with the direction of X, and image formation is synchronously carried out on a semi-conductor base material. Thereby, it lets a focusing unit pass and the maximum surface area of the mask which can carry out image formation on a semi-conductor base material is seldom restrained with the dimension of the field of the image of a focusing unit. this invention RISOGURAFU equipment which has a movable base material holder In the RISOGURAFU equipment which has the movable base material holder and the movable mask holder of the class indicated by the first paragraph It is the mask holder of the RISOGURAFU equipment of two goods holders of a separate pointing device which may be positioned by the pointing device separate in parallel also in the direction of Y in the direction of X, respectively. While the base of a separate positioning device is being fixed to the frame, the location which may irradiate the mask which can be installed on a mask holder according to the radiation source is an actuated position of a mask holder, and it is characterized by the positioning device of this invention being a positioning device of the above-mentioned exception individual. Since the 1st mask which exists for example, on the 1st mask holder by using this invention pointing device measures correctly the location occupied to the 1st mask holder, it can use measuring the location of a separate pointing device during actuation. The 2nd mask which exists on the 2nd mask holder can be irradiated at coincidence. . As mentioned above, the location of the 1st mask holder to the base does not receive effect in the separate balance unit of a positioning device substantially during migration of the 2nd mask holder which is the need during an exposure according to the reaction force which acts with the mobile unit of the 2nd mask holder. Therefore, measurement of the location of the 1st mask to the 1st mask holder is not substantially influenced according to the above-mentioned reaction force. It is because the frame of RISOGURAFU equipment does not generate vibration which is not desirable and this does not make the base of a separate positioning device generate mechanical oscillation substantially by migration of a mask holder. Before moving the 1st mask to an actuated position, since the above-mentioned location of the 1st mask is already measured correctly, it does not need to arrange the 1st mask to a focusing unit in an actuated position, and comparatively easy measurement of the location of the 1st mask to a focusing unit is enough as it is in an actuated position. Since the array of the mask to a focusing unit usually requires time amount, use of this invention pointing device increases the volume of RISOGURAFU equipment remarkably.

Next, with reference to a drawing, this invention is further explained to a detail.

Drawing 1 shows among a drawing this invention RISOGURAFU equipment which has a movable base material holder in diagram.

Drawing 2 is the diagram-top view of the 1st example of this invention pointing device which made movable the base material holder of the RISOGURAFU equipment of drawing 1.

Drawing 3 shows the pointing device of drawing 2 in the rotated location.

Drawing 4 is the diagram-top view of the 2nd example of this invention pointing device with the movable base material holder of the RISOGURAFU equipment of drawing 1 .

Drawing 5 shows the pointing device of drawing 4 which has two base material holders of a pointing device in the mid-position.

Drawing 6 shows in diagram this invention RISOGURAFU equipment which has a movable base material holder and a movable mask holder.

Drawing 7 shows in diagram the separate this invention pointing device used in order to move the mask holder of the RISOGURAFU equipment of drawing 6 .

this invention RISOGURAFU equipment shown in drawing 1 in diagram -- optical RISOGURAFU -- it is used for manufacture of an integrated semiconductor circuit by law and imaging ** according to the so-called principle of "Step ANDORE peat." As shown in drawing 1 in diagram, this RISOGURAFU equipment is supported on a frame 1 in order of this invention pointing device 3, the focusing unit 5, the mask holder 7, and the radiation source 9 so that it may have a frame 1 and it may be shown in parallel with a perpendicular Z direction. A pointing device 3 is equipped with the 1st base material holder 11 and the same 2nd base material holder 13. The RISOGURAFU equipment shown in drawing 1 is optical RISOGURAFU equipment, and the radiation source 9 has the light source 15. The base material holder 13 has the back face 21 which extends at right angles to a Z direction, and the base material holder 11 can install the 2nd semi-conductor base material 23 on this back face while it has the back face 17 which extends at right angles to a Z direction, respectively and can install the 1st semi-conductor base material 19 on this back face. In parallel [with the direction of X, and the direction perpendicular to a Z direction of Y] in parallel, the 2nd base material holder 13 can move the 1st base material holder 11 in the direction of X perpendicular to a Z direction relatively to a frame 1 in parallel with the direction of X, and the direction of Y with the 2nd mobile unit 27 of a pointing device 3 while it is relatively movable to a frame 1 with the 1st mobile unit 25 of a pointing device 3. The focusing unit 5 is an image pick-up system or a projection system, is equipped with the optical lens system 29 which has the primary-optic-axis line 31 to which it points in parallel with a Z direction, for example, has optical reduction percentage like 4 or 5. The mask holder 7 can be equipped with the back face 33 which extends at right angles to a Z direction, and can install a mask 35 on this. A mask 35 has the pattern or subpattern of an integrated semiconductor circuit. The beam-of-light beam generated from the light source 15 during actuation is guided through a mask 35, and converges on the 1st semi-conductor base material 19 according to a lens system 29, namely, carries out a focus, is the dimension which reduced the pattern on a mask 35, and carries out image formation on the 1st semi-conductor base material 19. The 1st semi-conductor base material 19 has many of each fields very much, and prepares the same semiconductor circuit on this field. The field of the 1st semi-conductor base material 19 is exposed one by one through a mask 35 for this purpose. Although the 1st semi-conductor base material 19 and a mask 35 are in a fixed location to the focusing unit 5 while exposing each field of the 1st semi-conductor base material 19, after exposing the one field, the next field is brought to the location to the focusing unit 5, and the 1st base material holder 11 is moved to whenever [the] in parallel with the direction of Y in parallel with the direction of X with the 1st mobile unit 25. This process is repeated many times and the complicated integrated semiconductor circuit of layer structure is manufactured through a mask which is different in whenever [that]. The integrated semiconductor circuit manufactured by RISOGURAFU equipment has the structure of the detailed dimension which exists within limits smaller than a micron. Since sequential exposure is carried out through the mask with which a large number differ, the 1st semi-conductor base material 19 is the precision of the range smaller than a micron, or needs to carry out image formation of the pattern on masks, such as this, even within the limits of NANOMETRA on the semi-conductor base material 19 in a certain precision. Therefore, the semi-conductor base material 19 is the precision which matches between two sequential exposure processes, and must be made to position to the focusing unit 5, and a very high demand is imposed on the positioning accuracy of a pointing device 3. A group's semi-conductor base material by which manufacture processing is carried out is exposed one by one through a mask 35 in the RISOGURAFU equipment shown in drawing 1 , and the semi-conductor base material of a top Norikazu team is exposed one by one through the following mask there. This process is repeated through other masks many times whenever [that]. The semi-conductor base material which should be exposed is in a magazine, and a semi-conductor base material is transported to the measuring point of a pointing device 3 one by one according to a transport station from this magazine. Since the above-mentioned magazine which is a known thing usual [both], and the above-mentioned transport station are brief, they are not illustrated to drawing 1 . In the state of the RISOGURAFU equipment shown in drawing 1 , the 1st base material holder 11 is in an actuated position, and the 1st semi-conductor base material 19

installed on the 1st base material holder 11 is irradiated by the radiation source 9 through the focusing unit 5. The 2nd base material holder 13 is in the above-mentioned measuring point of a pointing device 3, and the location to the 2nd base material holder 13 of the 2nd semi-conductor base material 23 installed on the 2nd base material holder 13 is measured by the optical location measurement unit 37 of the RISOGURAFU equipment shown in drawing 1 in diagram in the direction parallel to a direction parallel to the direction of X, and the direction of Y. Within this RISOGURAFU equipment, the 2nd semi-conductor base material 23 is positioned to the 2nd base material holder 13 in a predetermined precision according to the above-mentioned transport station. As shown in drawing 1, the optical location measurement unit 37 is also being fixed to the frame 1. After exposure of the 1st semi-conductor base material 19 is completed, the 1st base material holder 11 is moved from an actuated position to a measuring point with a pointing device 3, and the 1st semi-conductor base material 19 is returned to a magazine according to the above-mentioned transport station from this location so that it may explain below. Similarly, the 2nd semi-conductor base material 23 moves to an actuated position with a pointing device 3 from a measuring point so that it may explain below. The location of the 2nd semi-conductor base material 23 to the 2nd base material holder 13 is already measured in the measuring point, and since the 2nd semi-conductor base material 23 is positioned in the precision for which it wishes to the 2nd base material holder 13, in an actuated position, comparatively easy measurement of the location of a frame 1 and the 2nd base material holder 13 to the focusing unit 5 is enough as it. Measurement of the semi-conductor base material to a base material holder and positioning take comparatively much time amount. Therefore, the array of the semi-conductor base material to a base material holder can increase an output remarkably as compared with the RISOGURAFU equipment which has only one base material holder performed in an actuated position by use of this invention pointing device 3 which has two mobile units 25 and 27.

Drawing 2 and drawing 3 show the 1st example of this invention pointing device 3 which uses and fits the RISOGURAFU equipment of drawing 1. The mobile units 25 and 27 of a positioning device 3 have the X actuators 39 and 41 and the Y actuators 43 and 45, respectively. The X actuators 39 and 41 are equipped with parts for part I 47 and 49, respectively, and it is fixed to the base material holders 11 and 13 of the mobile units 25 and 27 which extend in parallel with the direction of X, and are related, and they can move a part for this part I relatively to parts for part II 51 and 53 of the related X actuators 39 and 41. The Y actuators 43 and 45 are equipped with parts for part I 55 and 57, respectively, and it is fixed to parts for part II 51 and 53 of the X actuators 39 and 41 of the related mobile units 25 and 27, and they can move a part for this part I relatively to parts for part II 59 and 61 of the related Y actuators 43 and 45 which extend in parallel with the direction of Y. The X actuators 39 and 41 and the Y actuators 43 and 45 are the so-called force actuators. While the amount of [parts for part I 47 and 49 of the X actuator 39 and / 51 and 53] part II which collaborates makes the mutual driving force of a predetermined value act in parallel in the direction of X during actuation. The amount of [parts for part I 55 and 57 of the Y actuators 43 and 45 and / 59 and 61] part II which collaborates makes the mutual driving force of a predetermined value act in the direction of Y in parallel during actuation. An isodynamia [this] actuator is a linear Lorentz force motor which is the usual known, and generates the Lorentz force of a predetermined value chiefly during actuation. Thus, the base material holders 11 and 13 become independent mutually with the suitable driving force of the X actuators 43 and 45 of the related mobile units 25 and 27, and are movable respectively in parallel with the direction of X. With the X-actuators 43 and 45 of the mobile units 25 and 27 related, respectively, the base material holders 11 and 13 become independent mutually with the suitable driving force of the Y actuators 43 and 45 of the related mobile units 25 and 27, and are movable in the direction of Y.

Furthermore, as drawing 2 and drawing 3 show, the Y actuators 43 and 45 of mobile units 25 and 27 are equipped with the interior 63 of a common straight-line proposal, and it is shown to them to parts for part I 55 and 57 of the Y actuators 43 and 45 movable in parallel in the direction of Y along this interior of a proposal. A pointing device 3 is equipped with the pivotable unit 65 which accepts on a drawing in diagram and is shown in it, and this pivotable unit 65 is equipped with the 1st disk-like section 67 fixed to the balance unit 69 of the pointing device 3 explained further below at a detail, and the 2nd disk-like section 71 fixed to the interior 63 of a common straight-line proposal. Around the axis of rotation 73 prolonged in parallel with a Z direction, the 2nd disk-like section 71 is pivotable to the 1st disk-like section 67.

The motor 75 shown in diagram is formed in the pivotable unit 65 for this purpose. It is fixed to the balance unit 69 and this motor 75 is connected with the 2nd disk-like section 71 with a driving belt 77. After the 1st semi-conductor base material 19 is exposed during actuation in an actuated position and the 2nd semi-conductor base material 23 is arranged to the 2nd base material holder 13 by the measuring point, the 2nd disk-like section 71 of the pivotable unit 65 rotates over 180 degrees around axis of rotation 73 to the 1st

disk-like section 67, therefore rotates the interior 63 of a common straight-line proposal around axis of rotation 73 with the 1st mobile unit 25 and the 2nd mobile unit 27. By the above-mentioned rotation inside [63] a common straight-line proposal, while moving the 1st mobile unit 25 to a measuring point from an actuated position as a whole with the 1st base material holder 11, the 2nd mobile unit 27 is moved to an actuated position from a measuring point as a whole with the 2nd base material holder 13. Drawing 3 shows the pointing device 3 in the location which performed a part of all rotation whose interior 63 of a common straight-line proposal is 180 degrees.

The balance unit 69 of the above-mentioned positioning device 3 is equipped with the comparatively heavy balance block which consists of a granite. The balance unit 69 is guided in parallel with the direction of X movable in parallel in the direction of Y by the static gas bearing which is not illustrated to drawing 2 and drawing 3 on the slideway 79 prolonged in parallel with the direction of Y in parallel with the direction of X. The slideway 79 is formed on the base 81 of the positioning device 3 shown in drawing 1. This base is being fixed to the frame 1 of RISOGURAFU equipment. Parts for part II 59 and 61 of the Y actuators 43 and 45 of two mobile units 25 and 27 are connected with the balance unit 69 which looks parallel to the direction of Y in parallel with the direction of X through the interior 63 of a common straight-line proposal, and the pivotable unit 65, therefore the balance unit 69 is taking the common balance unit into consideration for two mobile units 25 and 27 of a positioning device 3. It is generated from the driving force generated with the Y actuators 43 and 45 during actuation, and the reaction force of the actuators 43 and 45 which act on parts for part II 59 and 61 by parts for part I 55 and 57 of the Y actuators 43 and 45 is transmitted to the balance unit 69 through the interior 63 of a common straight-line proposal, and the pivotable unit 65. It is generated from the driving force generated with the X actuators 39 and 41, and the reaction force of the X actuators 39 and 41 which act on parts for part II 51 and 53 by parts for part I 47 and 49 of the X actuators 39 and 41 is transmitted to the balance unit 69 through parts for parts for part I 55 and 57, and part II 59 and 61, the interior 63 of a common straight-line proposal, and the pivotable unit 65 of the Y actuators 43 and 45. Since the balance unit 69 can move in parallel with the direction of Y in parallel with the direction of X in a slideway 79 top, the balance unit 69 moves it to the base 81 in parallel with the direction of X in response to an operation of the above-mentioned reaction force transmitted to this balance unit 69 in parallel with the direction of Y. Since the balance unit 69 is comparatively heavy, its distance which the balance unit 69 moves to the base 81 is comparatively small. Therefore, since the reaction force of two mobile units 25 and 27 is changed into migration of the balance unit 69 on a slideway 79, the above-mentioned reaction force does not make the balance unit 69, the base 81 of a positioning device 3, and the frame 1 of RISOGURAFU equipment produce mechanical oscillation. Such mechanical oscillation has a possibility of producing inaccurate positioning of two mobile units 25 and 27 which is not desirable.

As stated above, the X actuators 39 and 41 and the Y actuators 43 and 45 of mobile units 25 and 27 constitute the so-called force actuator for generating the driving force of a predetermined value. By using such a force actuator, the value of the driving force of mobile units 25 and 27 can be substantially made into the independent thing independently about the location which the amount of [47, 49, 55, and 57] part I occupies to parts for part II 51, 53, 59, and 61 of the X actuators 39 and 41 and the Y actuators 43 and 45 relatively. Since the location of the relative base material holders 11 and 13 follows the value of the driving force of the 1st mobile unit 25 and the 2nd mobile unit 27 to the base 81, respectively, by using a force actuator The above-mentioned location of the base material holders 11 and 13 becomes what became independent mostly to the location for parts for part I 47, 49, 55, and 57 of mobile units 25 and 27, and part II 51, 53, 59, and 61. Therefore, the above-mentioned location of the base material holders 11 and 13 becomes what became independent mostly to the location of the balance unit 69 connected with parts for relative part II 59 and 61 to the base material holders 11 and 13 connected with parts for part I 47 and 49. Therefore, migration of the balance unit 69 to which it points in parallel with the direction of X relatively to the base 81, Migration of the balance unit 69 to which it points in parallel with the direction of Y over the base 81, Migration of the balance unit 69 which has both a migration component parallel to the direction of X and a migration component parallel to the direction of Y does not have effect substantially in the location of the relative base material holders 11 and 13 to the base 81 relatively to the base 81. As mentioned above, such migration of the balance unit 69 is produced as a result of the reaction force of mobile units 25 and 27. Therefore, in the condition which shows in drawing 1, the mutual interference between the positioning accuracy of the mobile units 25 and 27 which the location of the relative 1st base material holder 11 does not receive effect in mechanical oscillation or the above-mentioned migration of the balance unit 69, therefore are produced from the reaction force of mobile units 25 and 27 is prevented to the location and the focusing unit 5 of the relative 2nd base material holder 13 to the location measurement unit 37.

Since the reaction force of mobile units 25 and 27 produces mechanical torque to the balance unit 69, the balance unit 69 rotates around axis of rotation to which it points in parallel with a Z direction while moving in parallel with the direction of Y in parallel with the direction of X in response to an operation of this reaction force. In parallel with the direction of X which does not have effect in the location of the relative base material holders 11 and 13 to the base 81 as effectiveness which uses a force actuator, unless such rotation of the balance unit 69 adopts a separate means unlike migration of the balance unit 69 parallel to the direction of Y, generally the location of the relative base material holders 11 and 13 is affected to the base 81. In order to prevent such effect that is not desirable, the control unit 83 shown in drawing 2 in diagram is formed in a positioning device 3, and a control unit 83 is made to collaborate in two optical location sensors 85 and 87 fixed to the base 81 of a positioning device 3. Position sensors 85 and 87 measure the direction of the interior 63 of the common straight-line proposal to the direction of Y. The motor 75 of the pivotable unit 65 is controlled by the control unit 83, and the interior 63 of a common straight-line proposal is made to hold in a location parallel to the direction of Y during actuation except for the moment that it is necessary to rotate the interior 63 of a straight-line proposal over 180 degrees. Therefore, parts for part I 47 and 49 of the X actuators 39 and 41 are made to hold in a location parallel to the direction of X. Since the interior 63 of a common straight-line proposal is held with a control unit 83 in a location parallel to the direction of Y Migration of the balance unit [as opposed to the base 81 in parallel with the direction of Y] 69 parallel to the direction of X and/or, And rotation of the balance unit 69 to the base 81 does not have effect substantially in the location of the base material holders 11 and 13 to the base 81. Therefore, the mutual interference between the positioning accuracy of the mobile units 25 and 27 generated from the rotation of the balance unit 69 produced according to reaction force again is prevented.

By guiding the balance unit 69 on a slideway 79 by the static gas bearing, guidance of the balance unit 69 which does not have friction substantially can be performed on a slideway 79. The migration of the balance unit 69 produced according to reaction force is not substantially blocked according to the frictional force between the balance unit 69 and a slideway 79. Consequently, reaction force is changed into migration of the balance unit 69 nearly completely, and does not make the base 81 and the balance unit 69 generate residual vibration mostly.

As shown in drawing 2 in diagram, the so-called drift prevention means 89 is further formed in a pointing device 3. In response to an operation of the interference force in which the balance unit 69 is not what was generated according to the external interference force 3, i.e., a positioning device, if another means was not provided, since it showed around on the slideway 79 in friction or the condition that there is nothing substantially, it may happen that the balance unit 69 moves freely in a slideway 79 top. The example of such interference force is a component of gravity which directs in parallel with a slideway 79 and acts on the balance unit 69 and a pointing device 3. If this component does not have a completely level slideway 79, it exists. The drift prevention means 89 makes the comparatively small drift prevention force act on the balance unit 69, and it prevents that the balance unit 69 moves freely. Furthermore, it is necessary to constitute the drift prevention means 89 so that migration of the balance unit 69 to the base 81 produced according to the reaction force of mobile units 25 and 27 may not be disturbed.

The drift prevention means 89 is equipped with two mechanical springs 91 and 93 and mechanical springs 95 in the example shown in drawing 2 . It is fixed to the base 81 and the balance unit 69, and the mechanical springs 91 and 93 make the comparatively small spring force act on the balance unit 69 in the direction of X in parallel. On the other hand, the mechanical spring 95 makes the comparatively small spring force act on the balance unit 69 in the direction of Y in parallel.

Drawing 4 and drawing 5 show the 2nd example of this invention pointing device 97 suitable for using it for RISOGURAFU equipment at drawing 1 . Also in drawing 4 and drawing 5 , the same sign shows the component of the RISOGURAFU equipment 97 corresponding to the component of RISOGURAFU equipment 3. The base material holders 11 and 13 in a pointing device 97 are guided in parallel in the direction parallel of X, and the direction of Y in a slideway 103 top movable, respectively by the so-called foot 99,101 which prepared the static gas bearing and which was supported in aerostatics. This slideway 103 is common to two base material holders 11 and 13, and extends in parallel with the direction of Y in parallel with the direction of X. In a pointing device 3, the X actuators 105 and 107 constituted as a force actuator, two Y actuators 109 and 111, and 113 and 115 are similarly prepared in the mobile units 25 and 27 of a pointing device 97, respectively. While preparing parts for part I 117 and 119 guided movable to parts for part II 121 and 123 which extend in parallel with the direction of X, respectively in the X actuators 105 and 107, parts for part I 125, 127, 129, and 131 guided movable to parts for part II 133, 135, 137, and 139 which extend in parallel with the direction of Y, respectively are formed in the Y actuators 109, 111, 113, and 115.

As shown in drawing 4, parts for part II 121 and 123 of the X actuators 105 and 107 are connected with both 129 and 131 [parts for part I 125 and 127 of two Y actuators 109, 111, 113, and 115 of the mobile units 25 and 27 related, respectively and]. The amount of [of the X actuators 105 and 107 / 121 and 123] part II rotates to the Y actuators 109 and 111 in relation to the surroundings of the pivoting axes 141, 143, 145, and 147 parallel to a Z direction, two part I 125 and 127 of 113 and 115, and 129 and 131. Parts for part I 117 and 119 of X actuator are connected with the base material holders 11 and 13 of the related mobile units 25 and 27 prepared in parallel with the direction of Y in parallel with the direction of X so that it might explain further below, respectively. Parts for part II 133, 135, 137, and 139 of the Y actuators 109, 111, 113, and 115 are being fixed to the balance unit 149 respectively common to two mobile units 25 and 27. This balance unit 149 is equivalent to the balance unit 69 of a positioning device 3, and a slideway 79 top is shown to this balance unit 149 in parallel with the direction of X to it movable in parallel in the direction of Y by the static gas bearing which is not shown in a drawing. A slideway 79 extends in parallel with the direction of Y in parallel in the direction of X, and belongs to the base 81 of the positioning device 97 fixed to the frame 1. The balance unit 149 is the common support for two base material holders 11 and 13 at coincidence, and the common slideway 103 of the base material holders 11 and 13 is a top face of the balance unit 149. The drift prevention means 89, 91, 93, and 95 are formed in the balance unit 149 of a positioning device 97 like the balance unit 69 of a positioning device 3. Respectively, it becomes independent mutually with the X actuators 105 and 107, and is movable in parallel with the direction of X, and the base material holders 11 and 13 become independent mutually with the equal movement magnitude of two more Y actuators 109 and 111 and two Y actuators 113 and 115, and its base material holders 11 and 13 are movable in parallel with the direction of Y. Under actuation, Parts for parts for part II 121 and 123 of the X actuators 105 and 107, parts for part I 125, 127, 129, and 131 of the Y actuators 109, 111, 113, and 115, and part II 133, 135, 137, and 139 of the Y actuators 109, 111, 113, and 115 While minding and transmitting the reaction force of the X actuators 105 and 107 to the balance unit 149 The reaction force of the Y actuators 109, 111, 113, and 115 is directly transmitted to the balance unit 149 through parts for part II 133, 135, 137, and 139 of the Y actuators 109, 111, 113, and 115.

The joint members 151 and 153 further explained to a detail can be formed in the base material holders 11 and 13, respectively, and the base material holders 11 and 13 can be connected with below in parallel with the direction of Y in parallel with the direction of X by turns by joint members, such as this, at a part for a part for part I 117 of the X actuator 105 of the 1st mobile unit 25, and part I 119 of the X actuator 107 of the 2nd mobile unit 27. A part for a part for part I 155 and part II 157 is prepared in the joint member 151 of the 1st base material holder 11 for this purpose. While enabling it to connect the 1st base material holder 11 with a part for part I 117 of the X actuator 105 of the 1st mobile unit 25 by part for part I 155 It enables it to connect the 1st base material holder 11 with a part for part I 119 of the X actuator 107 of the 2nd mobile unit 27 by part for part II 157. While forming a part for a part for part I 159, and part II 161 in the joint member 153 of the 2nd base material holder 13 and enabling it similarly to connect the 2nd base material holder 13 with a part for part I 117 of the X actuator 105 of the 1st mobile unit 25 by part for part I 159, it enables it to connect the 2nd base material holder 13 with a part for part I 119 of the X actuator 107 of the 2nd mobile unit 27 by part for part II 161. In the condition that drawing 1 and the condition 11 shown in drawing 4, i.e., the 1st base material holder, are in an actuated position, and the 2nd base material holder 13 is in a measuring point While connecting the 1st base material holder 11 with a part for part I 117 of the X actuator 105 of the 1st mobile unit 25 through a part for part I 155 of the joint member 151 The 2nd base material holder 13 is connected with a part for part I 119 of the X actuator 107 of the 2nd mobile unit 27 through a part for part II 161 of the joint member 153. In case the 1st base material holder 11 moves to a measuring point from an actuated position and the 2nd base material holder 13 moves to an actuated position from a measuring point, the base material holders 11 and 13 need to pass through the common slideway 103 top mutually.

the 2nd mid-position M which is made to move the 1st base material holder 11 to 1st mid-position M' shown in drawing 5 between an actuated position and a measuring point from an actuated position with the 1st mobile unit 25, and shows the 2nd base material holder 13 to coincidence from a measuring point with the 2nd mobile unit 27 at drawing 5 which is located between an actuated position and a measuring point and is next to 1st mid-position M' in order to attain this -- " -- it is made to move In above-mentioned mid-position M' and M", the base material holders 11 and 13 are not connected with the 1st mobile unit 25 and the 2nd mobile unit 27, respectively. Therefore, the amount of [of the X actuator 105 of the 1st mobile unit 25 / 117] part I moves to 2nd mid-position M" from 1st mid-position M', and it is this 2nd mid-position M", and is connected with a part for part I 159 of the joint member 153 of the 2nd base material holder 13. Similarly,

the amount of [of the X actuator 107 of the 2nd mobile unit 27 / 119] part I moves to 1st mid-position M" from 2nd mid-position M", and it is connected with a part for part II 157 of the joint member 151 of the 1st base material holder 11 in this 1st mid-position. Thus, it will be in the condition which shows in drawing 5 , and while the 1st base material holder 11 in 1st mid-position M' is connected with a part for part I 119 of the X actuator 107 of the 2nd mobile unit 27, the 2nd base material holder 13 in the 2nd mid-position of M " is connected with a part for part I 117 of the X actuator 105 of the 1st mobile unit 25. Finally, while the 1st base material holder 11 is moved from 1st mid-position M' to a measuring point with the 2nd mobile unit 27, the 2nd base material holder 13 is moved from 2nd mid-position M" to coincidence with the 1st mobile unit 25 in an actuated position. Since the distance which the amount of [of the Y actuators 109, 111, 113, and 115 / 125, 127, 129, and 131] part I must move to parts for part II 133, 135, 137, and 139 decreases by using the joint members 151 and 153, it decreases the dimension of mobile units 25 and 27. Furthermore, since the amount of [of the X actuators 105 and 107 / 121 and 123] part II needs to pass mutually in parallel with the direction of Y, mobile units 25 and 27 are maintained by easy structure.

As mentioned above, the joint members 151 and 153 of the base material holders 11 and 13 are constituted as the so-called XY Lorentz-force actuator. While having the permanent magnet system the amount of [of the joint member 15,153 / 155 and 159 / whose] part I is the usual known thing because of this purpose, the amount of [of the X actuator 105 of the 1st mobile unit 25 / 117] part I has the usual known electric coil system 163. This electric coil system 163 is designed so that it may collaborate in a part for a part for part I 155 of the joint member 151 of the 1st base material holder 11, and part I 159 of the joint member 153 of the 2nd base material holder 13 by turns. 1 set of permanent magnets of known respectively usual in parts for part II 157 and 161 of the joint members 151 and 153 -- having -- the l-th of the X actuator 107 of the 2nd mobile unit 27 -- 119 is equipped with the usual known electric coil system 165 for 1 minute. This electric coil system 165 is designed so that it may collaborate in a part for a part for part II 157 of the joint member 151 of the 1st base material holder 11, and part II 161 of the joint member 153 of the 2nd base material holder 13 by turns. A part for part I 155 of the coil system 163 and the joint member 151, a Lorentz force with XY Lorentz-force actuator parallel to the direction of X formed by the amount of [of the joint member 153 / 159] part I so that application might be possible, Are suitable for generating the moment of the Lorentz force parallel to the direction of Y, and the surrounding Lorentz force of the moment axis to which it points in parallel with a Z direction. The 2nd base material holder 13 with the above-mentioned XY Lorentz-force actuator so that the 1st base material holder 11 or application may be possible therefore, in parallel with the direction of X And/or, it can move in the direction of Y to part I 117 of the X actuator 105 of the 1st mobile unit 25 covering an parallel comparatively slight distance. Moreover, this 1st base material holder 11 or the 2nd base material holder 13 is pivotable to a part for part I 117 covering a comparatively small include angle around axis of rotation to which it points in parallel with a Z direction. A Lorentz force with XY Lorentz-force actuator parallel to the direction of X similarly formed by the amount of [of the joint member 153 / 161] part II so that a part for part II 157 of the coil system 165 and the joint member 151 and application might be possible, Are suitable for generating the moment of the Lorentz force parallel to the direction of Y, and the surrounding Lorentz force of the moment axis to which it points in parallel with a Z direction. The 2nd base material holder 13 so that the 1st base material holder 11 or application may be possible therefore, with the above-mentioned XY Lorentz-force actuator It can move in parallel with the direction of X to a part for part I 119 of the X actuator 107 of the 2nd mobile unit 27 covering a comparatively small distance parallel to the direction of Y. Moreover, the 1st base material holder 11 or the 2nd base material holder 13 is pivotable to a part for part I 119 covering a comparatively small include angle around axis of rotation to which it points in parallel with a Z direction. By using above-mentioned XY Lorentz-force actuator, especially, the easy and practical structure of the joint members 151 and 153 can be offered, and connection and balking of the joint members 151 and 153 can be easily attained through the operation and the object for bad harvest of a Lorentz force which act between the above-mentioned magnet system and a coil system. Furthermore, this XY Lorentz-force actuator acts as 2nd detailed drive stage for mobile units 25 and 27. Thereby, the base material holders 11 and 13 can be positioned comparatively correctly to the 1st drive stage formed by the X actuators 105 and 107 and the Y actuators 109, 111, 113, and 115.

The balance unit 149 of a positioning device 97 rotates like the balance unit 69 of a positioning device 3 around axis of rotation to which it points in parallel with a Z direction as a result of the reaction force of the mobile units 25 and 27 which act on this balance unit 149. In order that rotation of the balance unit 149 may prevent making the migration of the base material holders 11 and 13 to the base 81 which is not desirable produce, The 1st control unit 167 and the 2nd control unit 169 are formed in a pointing device 97. A part for

part II 121 of the X actuator 105 of the 1st mobile unit 25 can be held in a location parallel to the direction of X with the 1st control unit 167. A part for part II 123 of the X actuator 107 of the 2nd mobile unit 27 can be held in a location parallel to the direction of X with the 2nd control unit 169. As shown in drawing 4, the 1st control unit 167 collaborates in two optical location sensors 171 and 173 fixed to the base 81, and measures the direction of the X actuator 105 to the direction of X of [for part II / 121] by optical location sensors, such as this. Similarly, the 2nd control unit 169 collaborates in two photo sensors 175 and 177 fixed to the base 81, and measures the direction of the X actuator 107 to the direction of X of [for part II / 123] by optical location sensors, such as this. When the balance unit 149 rotates, as for the 1st control unit 167, two Y actuators 109 and 111 of the 1st mobile unit 25 are controlled so that the amount of [of the X actuator 105 / 121] part II stops at a location parallel to the direction of X. Similarly, when the balance unit 149 rotates, as for the 2nd control unit 169, two Y actuators 113 and 115 of the 2nd mobile unit 27 are controlled so that the amount of [of the X actuator 107 / 123] part II stops at a location parallel to the direction of X. Thus, rotation of the X actuators 105 and 107 used as the cause which generally causes the migration of the base material holders 11 and 13 to the base 81 which is not desirable, and the base material holders 11 and 13 connected with it is prevented by holding parts for part II 121 and 123 of the X actuators 105 and 107 in a location parallel to the direction of X.

Imaging ** by the so-called principle of "a step and a scan" is used for this invention RISOGURAFU equipment shown in drawing 6 in diagram. The same sign shows the component equivalent to the component of the RISOGURAFU equipment shown in drawing 1 in drawing 6. In imaging ** by the principle of "a step and a scan", during exposure, the 1st semi-conductor base material 19 is not in a fixed location to the focusing unit 5, but it moves the 1st semi-conductor base material 19 and a mask 35 synchronously in parallel with the direction of X to the focusing unit 5 among a shot. While forming the pointing device 3 for moving the 1st semi-conductor base material 19 to the RISOGURAFU equipment of drawing 6 for this purpose, the separate pointing device 179 to which a mask 35 is moved in parallel with the direction of X to the focusing unit 5 is formed. It is this invention pointing device which this separate pointing device 179 also has in the RISOGURAFU equipment of drawing 6. As shown in drawing 6 in diagram, this separate pointing device 179 has the 1st mask holder 181 and the same 2nd mask holder 183. The mask holders 181 and 183 are back faces which extend at right angles to a Z direction, respectively, and have the back face 185 which can install the 1st mask 35 on this back face, and the back face 187 which is a back face which extends at right angles to a Z direction, and can install 2nd mask 35' on this back face. The 1st frame of the 1st mask holder 181 can be positioned [with the 1st mobile unit 189 of a pointing device 179] to 1 in parallel in parallel with the direction of Y in the direction of X, and it can position the 1st frame of the 2nd mask holder 183 to 1 in parallel with the 2nd mobile unit 191 of a pointing device 179 in parallel with the direction of Y in the direction of X. In the condition which shows in drawing 6, the 1st mask holder 181 is in the actuated position of a pointing device 179, it can irradiate the 1st semi-conductor base material 19 through the 1st mask 35, and, on the other hand, the 2nd mask holder 183 is [mask / 35 / 1st] in the measuring point of a pointing device 179 with 2nd mask 35'. In this measuring point, the location of 2nd mask 35' to the 2nd mask holder 183 can be measured by the location measurement unit 193 with the separate RISOGURAFU equipment fixed to the frame 1 of RISOGURAFU equipment. Since it is brief, 2nd mask 35' can be further positioned to a measuring point in a required precision to the 2nd mask holder 183 according to the separate transport station which is not illustrated to drawing 6. This transport station is used and the mask by which sequential use is carried out is transported to the measuring point of a pointing device 179 from a mask magazine. Since the semi-conductor base material of one piece or some is irradiated, after finishing using the 1st mask 35, the 1st mask holder 181 is moved to a measuring point from an actuated position with a pointing device 179, and the 1st mask 35 is returned to a mask magazine from a measuring point according to the above-mentioned transport station. The 2nd mask holder 183 is moved from a measuring point to coincidence with 2nd mask 35' with a pointing device 179 in an actuated position. By using this invention pointing device 179, the output of RISOGURAFU equipment can be increased further. It is because the mask which should be used is already arranged to the related mask holder one by one if this arrives at an actuated position.

The separate pointing device 179 is shown in drawing 7 in diagram. The mask holders 181 and 183 of this pointing device 179 are guided movable in the direction of Y in parallel with the direction of X by the feet 195 and 197 supported in aerostatics parallel, respectively in the common slideway 199 top of the base material 201 which extends in parallel with the direction of Y in parallel in the direction of X. A base material 201 is fixed to the balance unit 205 through the pivotable unit 203. On the slideway 207 which forms some bases 209 of a positioning device 179, the balance unit 205 is guided in parallel by the static gas

bearing movable in parallel with the direction of Y in the direction of X. As shown in drawing 6 in diagram, the base 209 of a positioning device 179 is being fixed to the frame 1 of RISOGURAFU equipment. The pivotable unit 203 and the balance unit 205 of a positioning device 179 are mostly equivalent to the pivotable unit 65 and the balance unit 69 of the positioning device 3 explained previously.

The 1st mobile unit 189 of a pointing device 179 and the 2nd mobile unit 191 are equipped with the X actuators 211 and 213 constituted as a force actuator, respectively. The X actuators 211 and 213 are equipped with parts for part I 215 and 217 movable in parallel in the direction of X to parts for part II 219 and 221 of the related X actuators 211 and 213 which extend almost in parallel with the direction of X, respectively. Parts for part II 219 and 221 of the X actuators 211 and 213 are being fixed to the base material 201, and the amount of [219 and 221] part II, such as this, has the interior 223 of a common straight-line proposal which extends almost in parallel with the direction of X. Furthermore, mobile units 189 and 191 are equipped with XY Lorentz-force actuators 225 and 227, respectively, and this actuator has the electric coil systems 233 and 235 fixed to parts for part I 215 and 217 of the X actuators 211 and 213 of the mobile units 189 and 191 relevant to the permanent magnet systems 229 and 231 fixed to the mask holders 181 and 183 of the related mobile units 189 and 191. The mask holders 181 and 183 are comparatively low precision by the X actuators 211 and 213 covering a comparatively big distance. It can be made to move in parallel with the direction of X to the base 209, and, on the other hand, the mask holders 181 and 183 are comparatively high precision by XY Lorentz-force actuators 225 and 227 covering a comparatively small distance. As opposed to parts for part I 215 and 217 of the X actuators 211 and 213 parallel to the direction of X, and the direction of Y It can be made to move and, moreover, the mask holders 181 and 183 are pivotable covering the include angle limited to the surroundings of the axis to which it points in parallel with a Z direction to parts for above-mentioned part I 215 and 217. By using XY Lorentz-force actuators 225 and 227, during exposure of a semi-conductor base material, the mask holders 181 and 183 can be positioned in an parallel comparatively high precision in the direction of Y, and migration of the mask holders 181 and 183 to which it points in parallel with the direction of X can be made into altitude to the direction of X at parallel. Finally, the pointing device 179 as well as a pointing device 3 has a control unit 237. Except for the moment of rotating a base material 201 over 180 degrees to the base 209 by the pivotable unit 203, the straight-line guidance 223 is held in a location parallel to the direction of X with a control unit 237 during actuation. To be shown in drawing 7 in diagram, a control unit 237 collaborates in two optical location sensors 239 and 241, and this control unit 237 controls the motor 243 of the pivotable unit 203.

In drawing 1 and the RISOGURAFU equipment shown in drawing 6 , the semi-conductor base material of the group under manufacture is irradiated one by one through a certain mask, and the sequential exposure of this group is carried out through the following mask. By using this invention pointing devices 3 and 97 for moving a semi-conductor base material, the output of RISOGURAFU equipment can be increased remarkably, and since a mask is moved further, an output can be further increased by using the pointing device 179 with separate this invention. As a sequential exposure is performed to the semi-conductor base material under manufacture through a series of masks and the following semi-conductor base material is irradiated through the mask of a top Norikazu ream, this invention can be applied to RISOGURAFU equipment. RISOGURAFU equipment in case the pointing device for migration of a mask is this invention equipment chiefly and the pointing device for migration of a semi-conductor base material is the usual pointing device can also attain increase of most outputs of RISOGURAFU equipment.

It is used for above-mentioned this invention RISOGURAFU equipment exposing a semi-conductor base material in manufacture of an accumulation electronic semiconductor circuit. Image formation of the mask pattern can be carried out on a base material with RISOGURAFU equipment, and such RISOGURAFU equipment can be used also for manufacture of other products which established the structure of having the detailed dimension of the range below a micron. As the example, there are structure of the conduction detection pattern of an integrated optics system or a magnetic domain store and structure of a liquid crystal image display pattern.

this invention pointing device is not only used for RISOGURAFU equipment, but can arrange a finish machine, a machine tool, and the goods that should be processed to the goods holder in a measuring point, and it can use them for the machine processed next in an actuated position, or equipment.

As mentioned above, the mobile units 25 and 27 of this invention positioning device 3 have the X actuators 39 and 41 and the Y actuators 43 and 45, respectively. The mobile units 25 and 27 of the above-mentioned this invention positioning device 97 are equipped with the X actuator 105, 107 or 2 Y actuators 109 and 111, 113 and 115, and XY Lorentz-force actuators 151 and 153, respectively. The mobile units 189 and 191 of the above-mentioned this invention positioning device 179 are equipped with the X actuators 211 and 213

and XY Lorentz-force actuators 225 and 227, respectively. Moreover, this invention pointing device may be equipped with the mobile unit of an alternative format. therefore, instead of [of an above-mentioned linear X actuator and Y actuator] -- the so-called usual planar of itself known -- electromagnetism -- a motor may be used. On the other hand, moreover, among the base material holders 11 and 13 corresponding to instead of with each for two part I 47 and 49 of the X actuators 39 and 41 It is also possible to use a XYZ Lorentz-force actuator in a pointing device 3. In the direction of Y in parallel with the direction of X by this for example, in a high precision to a Z direction in parallel The base material holders 11 and 13 are made movable to parts for corresponding part I 47 and 49 covering a slight distance. Furthermore, the base material holders 11 and 13 can be made pivotable to parts for corresponding part I 47 and 49 covering the include angle limited to the surroundings of axis of rotation parallel to the direction of X, axis of rotation parallel to the direction of Y, and axis of rotation parallel to a Z direction. Such a XYZ Lorentz-force actuator can be replaced with XY Lorentz-force actuator currently used and the foot supported in aerostatics, for example, can be used in a pointing device 97,179.

[Translation done.]

* NOTICES *

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1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]

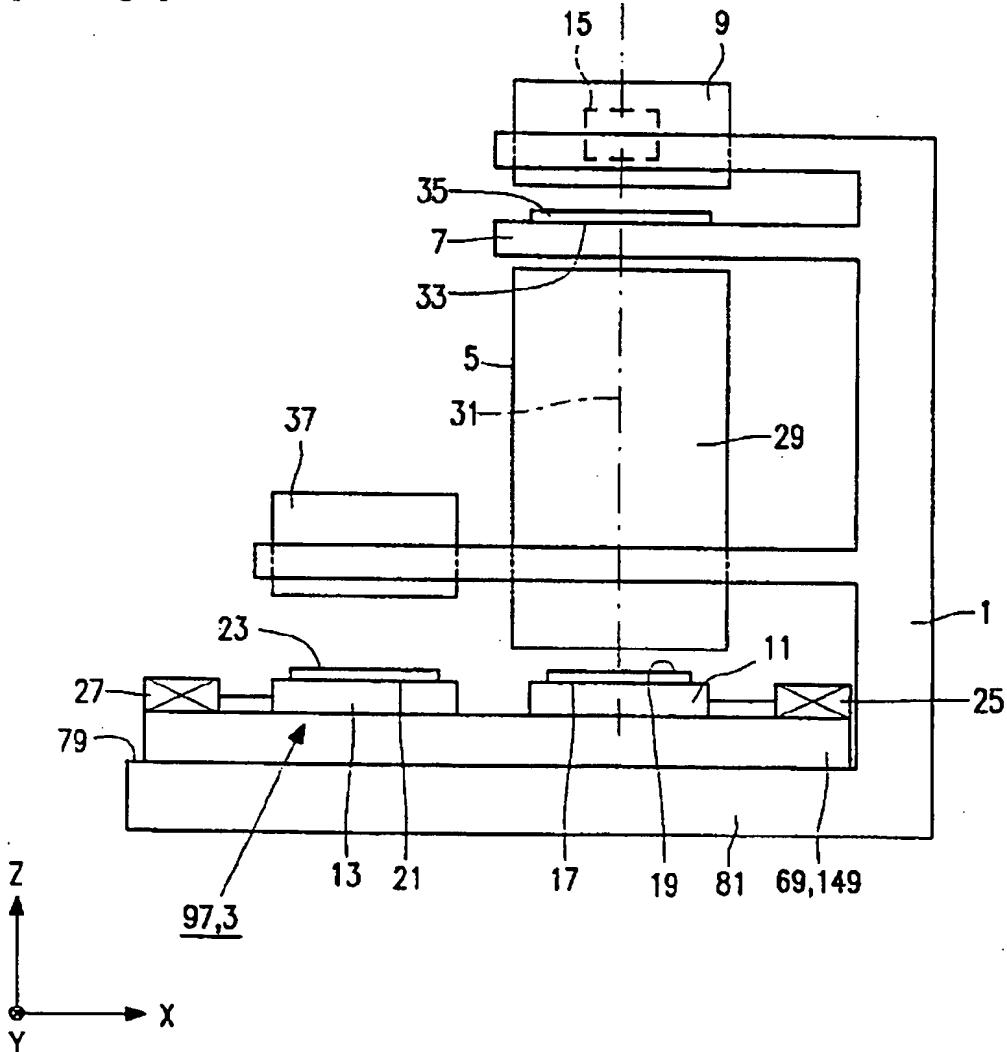
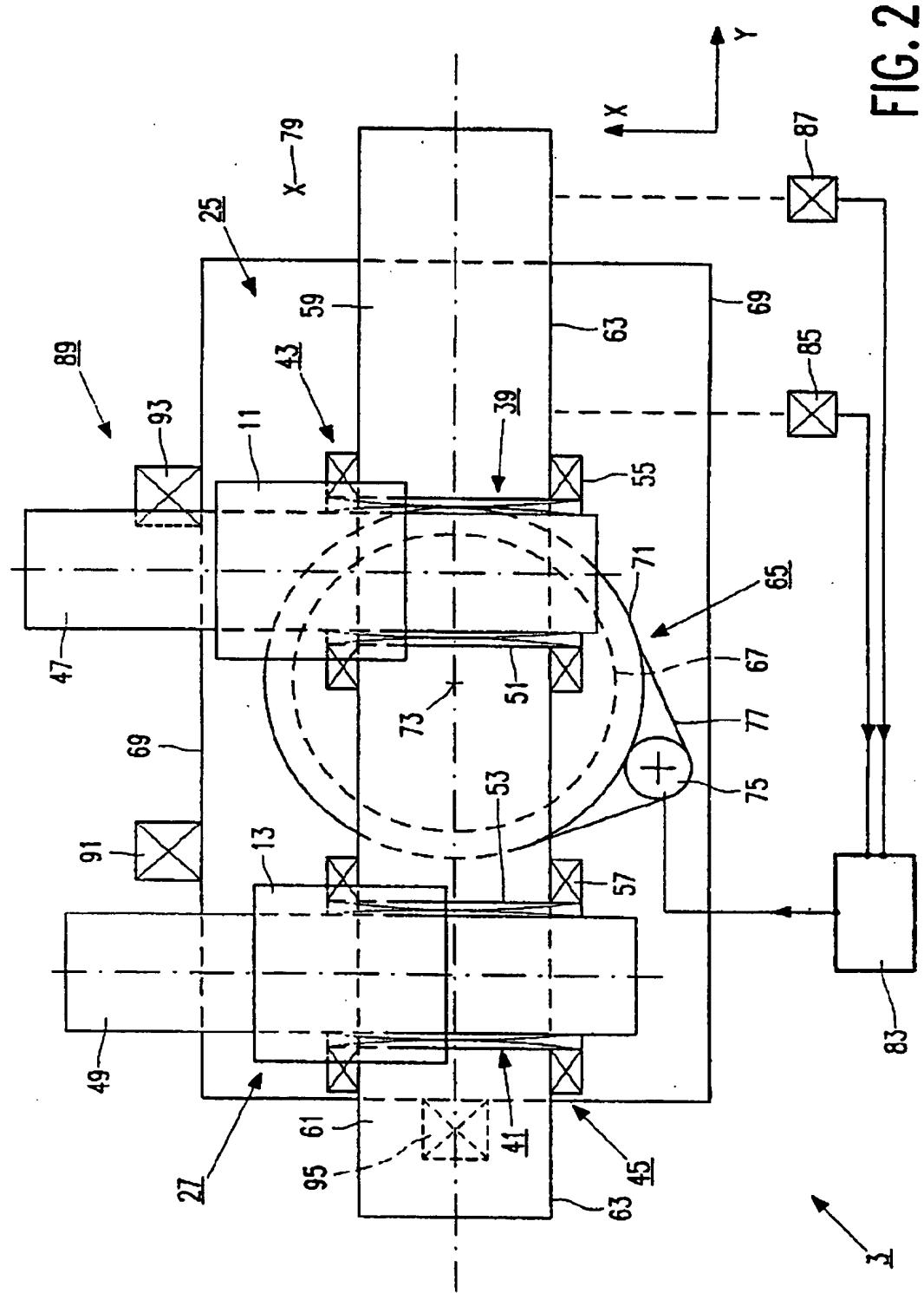


FIG. 1

[Drawing 2]



[Drawing 3]

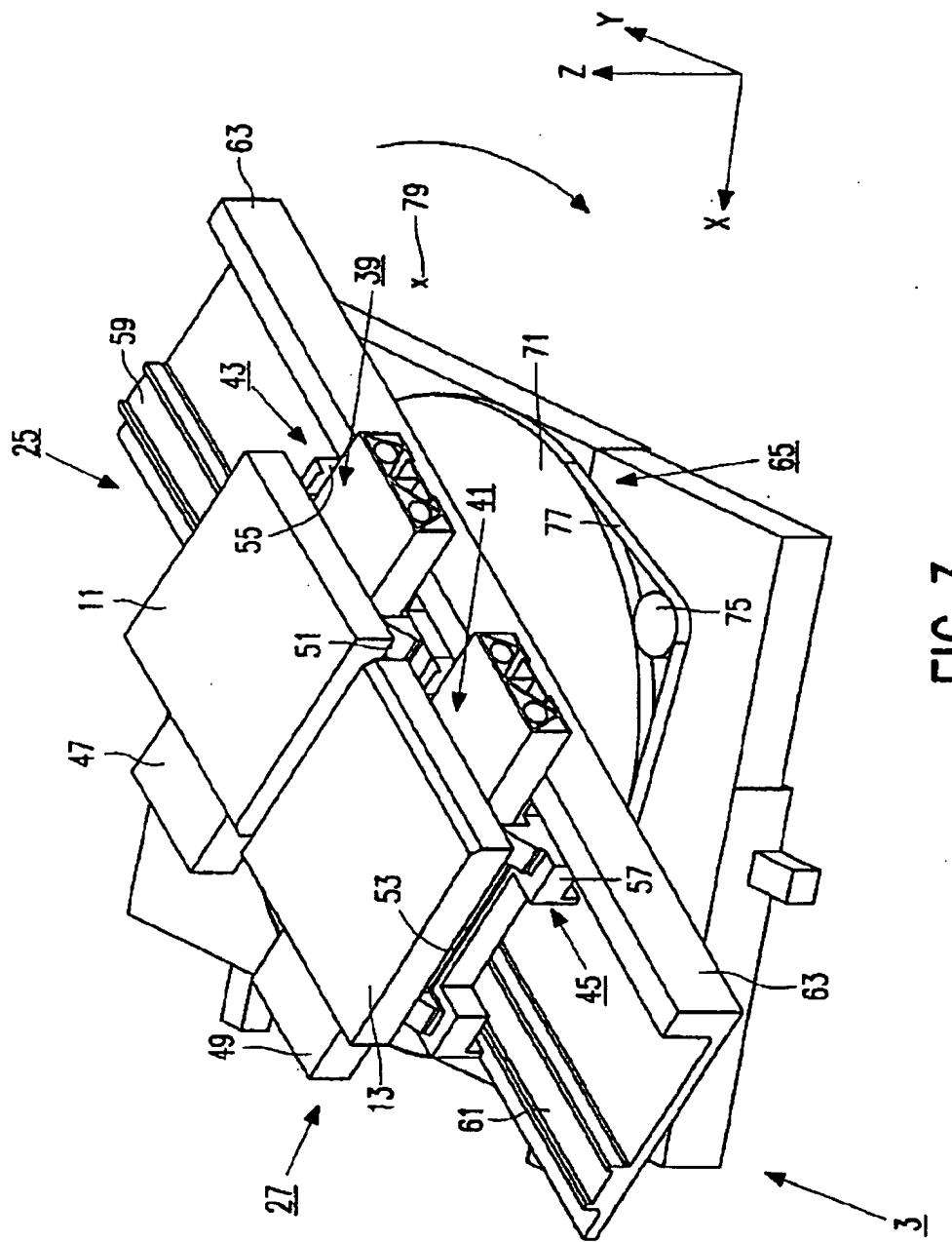
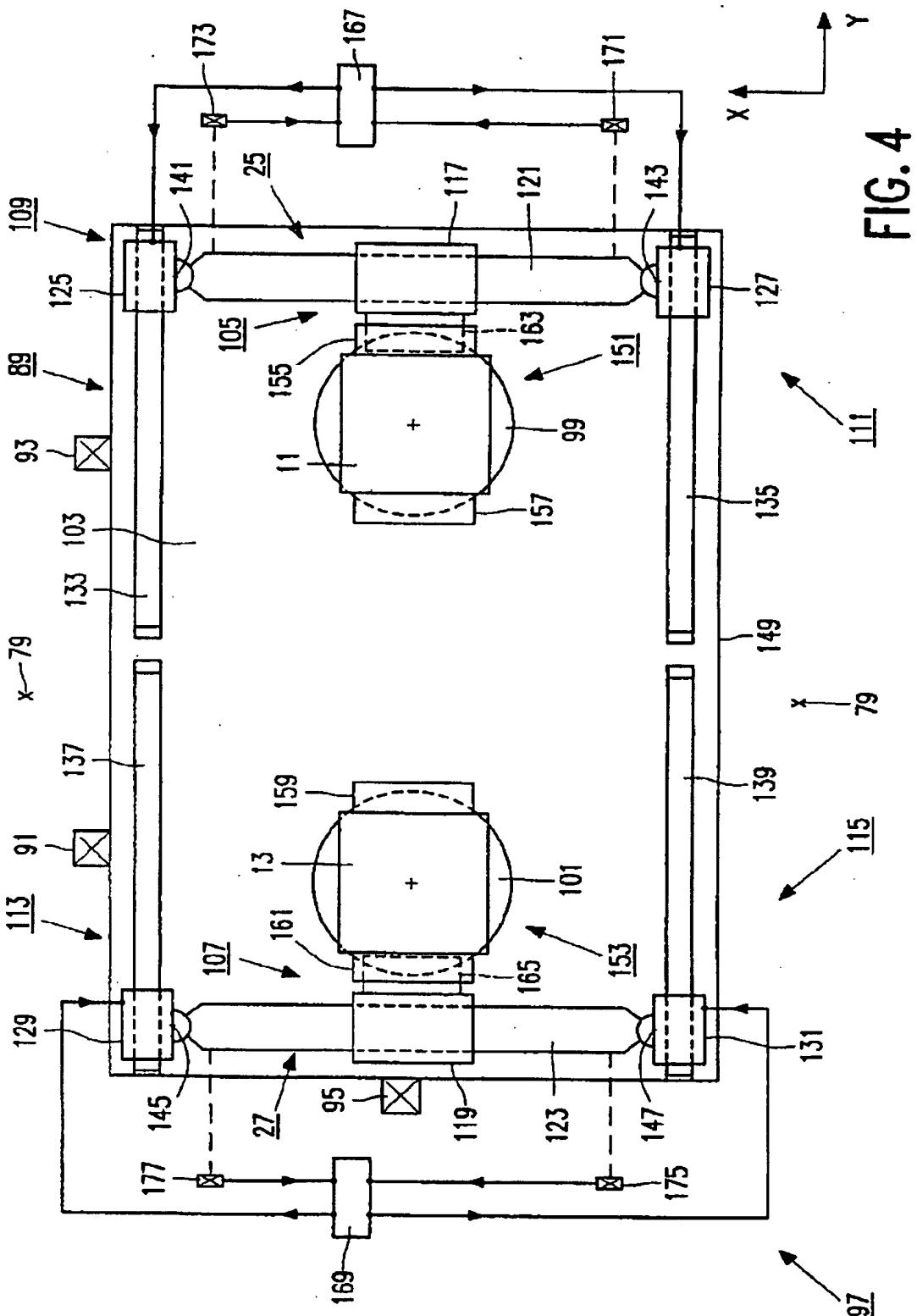
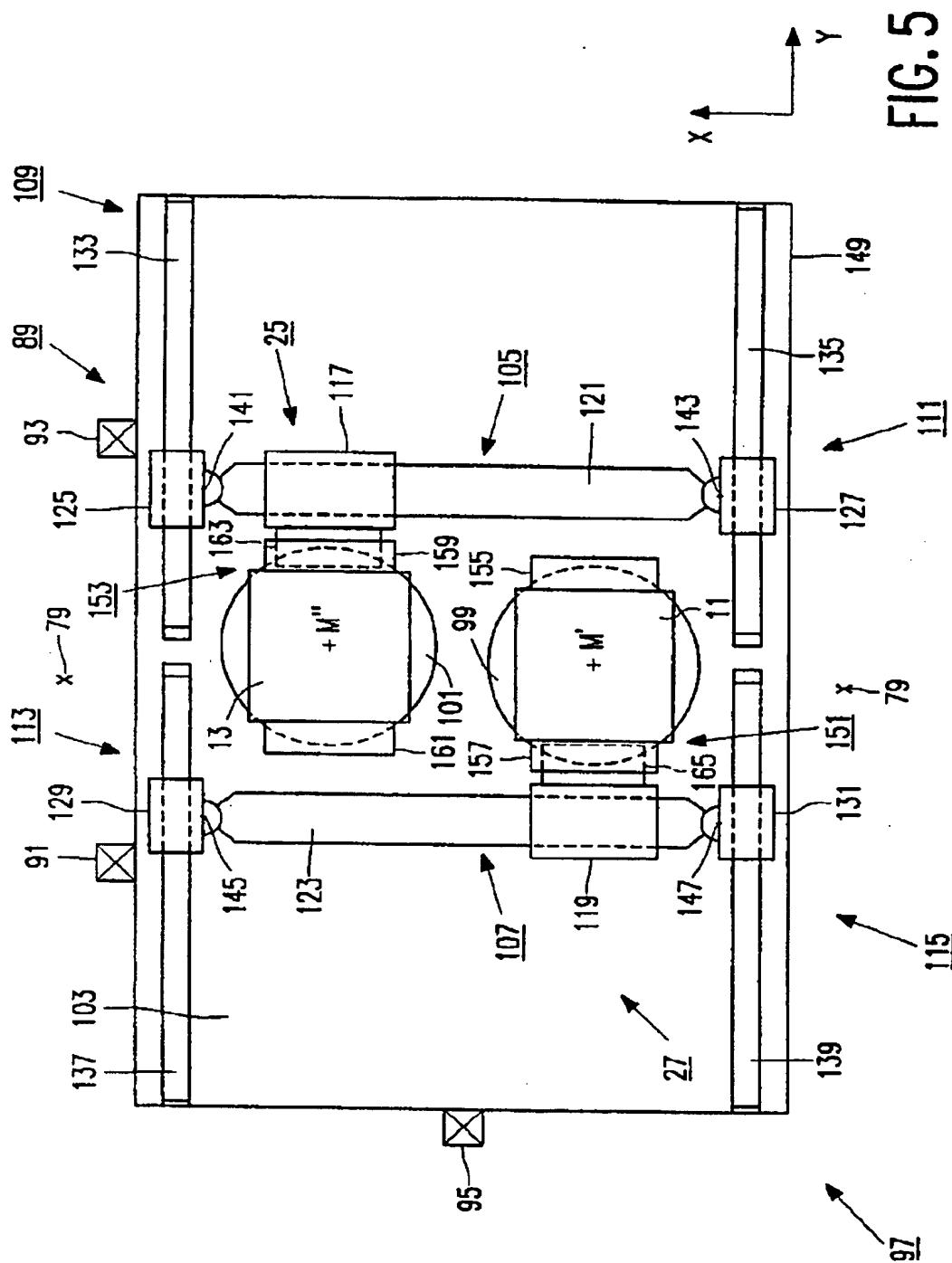


FIG. 3

[Drawing 4]



[Drawing 5]



[Drawing 6]

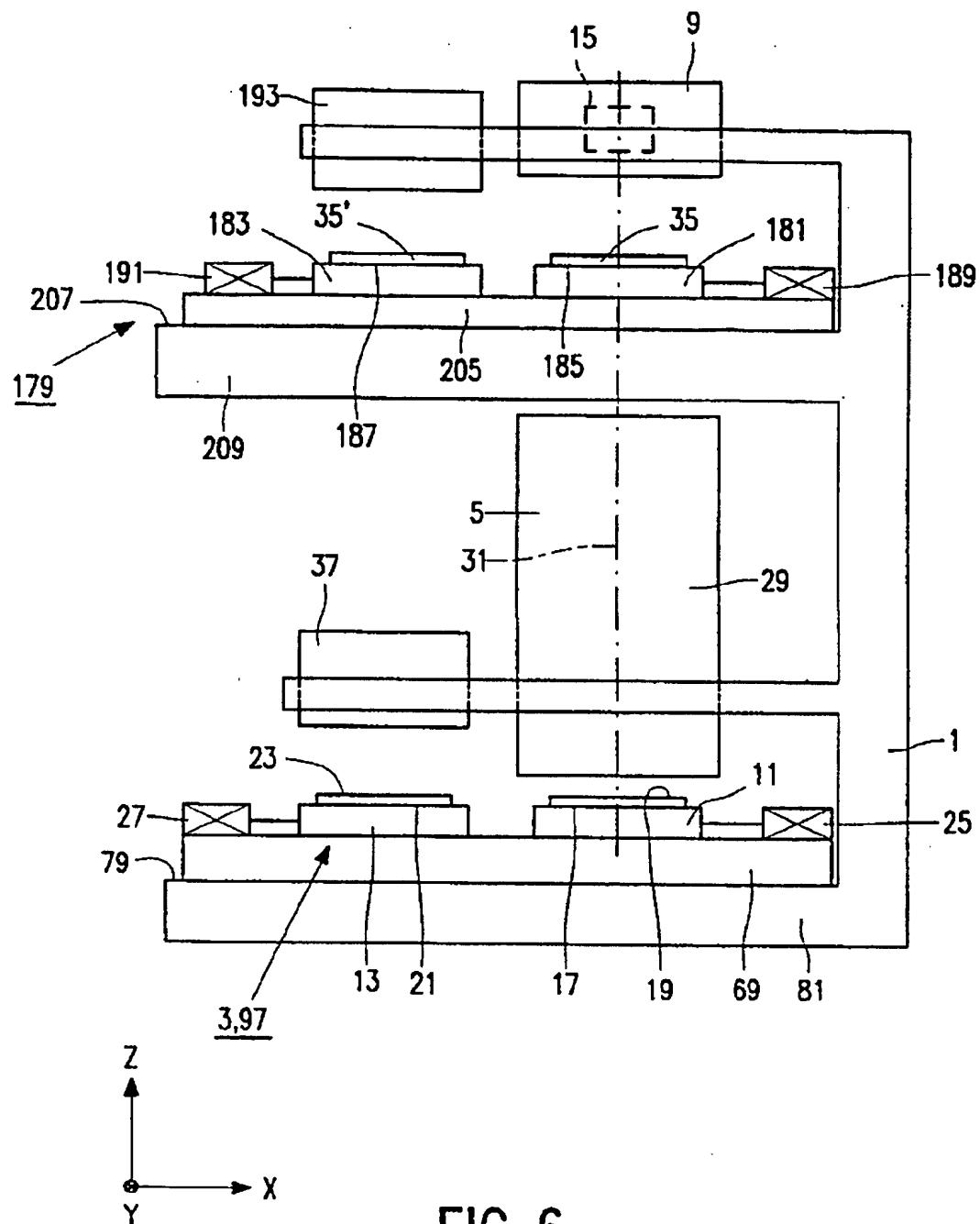
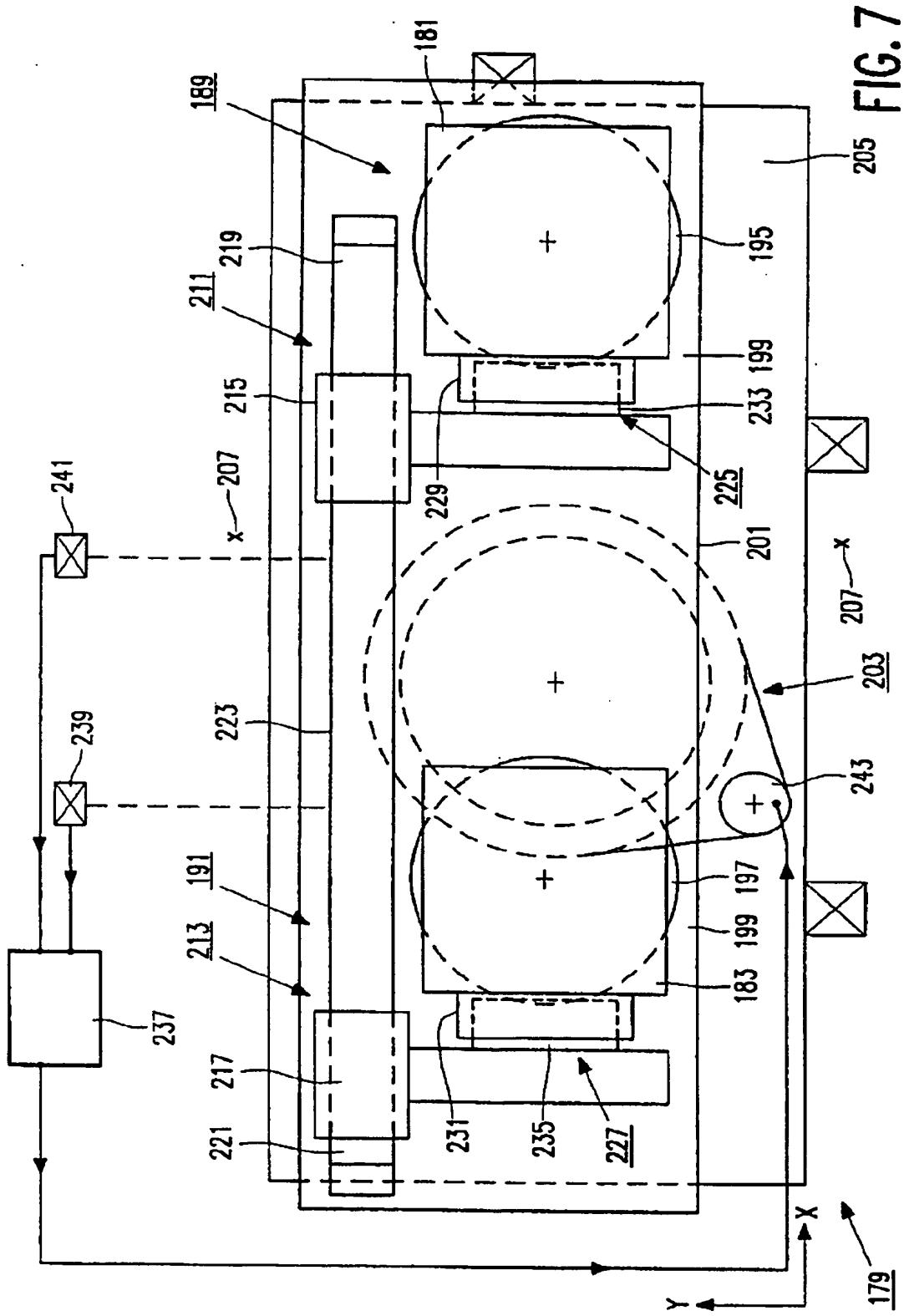


FIG. 6

[Drawing 7]



[Translation done.]